In the Specification

Please replace the title of the present application as seen on page 1 of the specification with the following amended title:

Cleaning Apparatus for Dispensing a Heated Cleaning Fluid

Please replace paragraph [0021] with the following amended paragraph:

[0021] The prior art apparatus shown in Fig. 1 includes a fluid applicator/recovery tool which is generally indicated by the numeral 30, and which is removably coupled to the moveable chassis 11. The fluid applicator/recovery tool 30 includes a first end 31 which is moved by hand, in a given pattern across the supporting surface 13. Still further, the fluid applicator/recovery tool 30 has an opposite second end 32, which is grasped by the operator (not shown). A vacuum hose 33 couples the second end 32 of the fluid applicator/recovery tool to the fluid recovery tank 21. Yet further, a cleaning fluid delivery conduit 34 is coupled in fluid flowing relation to the fluid holding tank 20, and is operable to deliver the cleaning fluid contained therein to the fluid applicator/recovery tool 30. Those skilled in the art will recognize that the prior art device delivers the cleaning fluid from the fluid holding tank 20 to the fluid applicator portion ~~30A~~ 30a of the fluid applicator/recovery tool 30, and thereafter the recovery tool portion of same ~~30B~~ 30b is drawn across the area of the supporting surface 13 where the cleaning fluid has been applied. This cleaning fluid is suctioned, along with any dissolved dirt or other debris found on the supporting surface 13 into the recovery tool portion 30B and is delivered to the fluid recovery tank 21.

Please replace paragraph [0022] with the following amended paragraph:

[0022] Referring now to Fig. 2, a second prior art device 40 is shown and which can also be utilized to clean carpets and the like. The second prior art device 40 has a chassis 41 which is mounted on a pair of wheels 42 and which moveably engage a supporting surface 43 to be cleaned ~~43~~. The prior art device 40 has a control panel 44 which is closely adjacent to a handle 45. The handle 45 is utilized by an operator, not shown, and which permits the operator to maneuver the prior art device 40 during operation. The device 40 is typically drawn backwards, or in the direction of the arrow as shown in Fig. 2 while the device is operation. The prior art device 40 includes a fluid holding tank 50 which receives heated water, and other detergents which are to be applied to the supporting surface 43. Still further, the chassis 41 supports a fluid recovery tank 51 which receives debris and dirt vacuumed from the supporting surface 43, as well as cleaning liquid which has been applied, and then recovered from the supporting surface 43. The fluid recovery tank 51, once filled to capacity, is drained into an appropriate drain. Thereafter, the fluid holding tank 50 is refilled with heated water and other detergent for purposes of continuing the cleaning operation. The device 40, as seen in Fig. 2 includes a power cable 52 which provides AC power to operate same. Still further, a transparent dome 53 covers the fluid recovery tank 51, and allows the operator to view the contents of the tank. Similar to the device shown in Fig. 1, this second prior art device 40 includes a fluid applicator/beater-bar tool 62 which incorporates one or more spray nozzles that are operable to deliver the cleaning fluid and detergent contained within the fluid holding tank 50 to the supporting surface 43. The applicator/beater-bar tool 62 also incorporates a beater-bar (not shown) that is operable to work the cleaning fluid into the fibers of the supporting surface 43. Thereafter, the vacuum shoe 60 vacuums this same liquid back up along with any debris and dirt that is dissolved or suspended within this cleaning fluid and delivers it to the fluid

recovery tank 51 by way of a first vacuum hose 61. Still further, the second prior art device 40 includes a second hose 63 which is operable to couple the vacuum pump in fluid flowing relation, (not shown), to the fluid recovery tank 51.

Please replace paragraphs [0026] - [0033] with the following amended paragraphs:

[0026] As seen in Fig. 3, the invention includes a fluid conduit 111 which couples the cleaning fluid dispenser 110 in selective fluid flowing relation relative to the fluid dispensing tank 72. As seen in Fig. 3, a remotely controllable fluid flow control device 112 is provided, and which is operable to direct the heated cleaning fluid 73 to the cleaning fluid dispenser 110 and/or fluid dispensing tank 72 under certain operational conditions which will be discussed in greater detail hereinafter. The cleaning fluid dispenser may be made integral with a fluid extractor or recovery tool which is generally indicated by the numeral 120. In some forms of the invention, these two assemblies may be separate and distinct. The fluid dispenser 110, and fluid extractor 120 may also be of a similar construction to that discussed earlier with respect to the prior art devices shown in Figs. 1 and 2. The cleaning fluid extractor 120 is coupled in fluid flowing relation relative to a vacuum motor 130 which is borne by the housing 70. The vacuum motor 130 is operable to remove cleaning fluid which has been dispensed by the fluid dispenser 110 onto an object of interest such as carpeting. The suction provided by the vacuum motor 130 recovers the cleaning fluid from the object of interest and delivers same into a fluid recovery tank which is generally indicated by the numeral 140. Referring still to Fig. 3 it will be seen that the housing 70 may further include an optional chemical tank 150 within which detergents of various types can be placed so that they may be added to the cleaning fluid (typically water) which is dispensed from the fluid dispensing tank 72. The optional chemical tank 150 is coupled by

way of a fluid conduit 151 to the fluid conduit 105. A valve 152 is provided and which may meter the contents of the optional chemical tank to the fluid conduit 105.

[0027] As best seen by reference to Fig. 3, a fuel source 160 is provided, and which is borne by the housing 70 and which provides a source of fuel which may be rendered combustible and utilized by a catalytic heater which will be discussed in further detail hereinafter. The fuel source may comprise bottled hydrogen, methanol, or any other fuel which may be mixed with a source of air, such as ambient air, in order to provide a combustible mixture. The fuel source 160 is coupled in fluid flowing relation relative to a fuel conduit 161. Mounted along the fuel conduit is a remotely controllable fluid flow control device 162 which when rendered operational, produces a fuel stream generally indicated by the numeral 163. The fuel stream is coupled by way of the fuel conduit 161 to a heating enclosure which is generally indicated by the numeral 170. The heating enclosure defines a passageway 171. Moreover, the heating enclosure may further include a mixing plenum or portion 172 which substantially mixes the air stream 181 with the fuel stream 163 which is supplied to the passageway 171. A blower assembly 180 is mounted on the heating enclosure 170, and is operable, when energized, to produce an air stream 181 either from a separate source of air, or from the surrounding ambient air, and which is delivered to the heating enclosure. As illustrated, the source of combustible fuel 160 is mixed with the air stream 181 and which is produced by the blower assembly 180 in predetermined amounts. This mixture of combustible fluid fuel and air has a stoichiometry which is defined, in part, by a lower explosive limit. In the arrangement as shown, the mixture of fuel stream 163 provided by the fuel source 160, and the air stream 181 provided by the blower 180 comprises a non-flammable mixture which has a stoichiometry of less than about one-half (½) of the lower explosive limit during normal operation of the

cleaning apparatus 10. In one form of the invention, the fuel source 160 comprises hydrogen. If this fuel is used, it has been found convenient to employ a mixture of hydrogen and air which contains less than about 2% by volume during normal operation.

[0028] Mounted on the heating enclosure 170, and coupled in fluid flowing relation relative to ~~a~~ the passageway 171 is a catalytic heater 190. The catalytic heater may comprise a substantially monolithic catalyst block, or any other design which, when supplied with the non-explosive mixture of air and fuel provides a sufficient amount of heat to heat the cleaning fluid moving through the heat exchanger 100. Still further, and as seen in Fig. 3, it will be noted that an air stream or air flow sensor 191 is mounted in sensing relation relative to the passageway 171. This sensor 191 is operable to detect the volume of the air stream 181 which is mixed with ~~a~~ the combustible fluid fuel 160. The sensor 191 produces an electrical signal representative of this air volume. Still further, it will be seen from Fig. 3 that a fuel sensor 192 is provided in downstream sensing relation relative to the heat exchanger 100. The fuel sensor 192 is operable to detect any fuel 160 which passes through the catalytic heater 190. Still further, a temperature sensor which is generally indicated by the numeral 193 is disposed in downstream sensing relation relative to the heat exchanger 100 and is operable to detect the temperature of the cleaning fluid which has been heated by the heat exchanger 100.

[0029] As seen in Fig. 3, a controller 200 is provided and which is coupled by way of electrical pathways 201 with the pump 90; the remotely controllable fluid flow control devices 112 and 162; the air flow sensor 191; the fuel sensor 192; and the temperature sensor 193. The controller 200 is operable to coordinate the operation of these various devices so that the catalytic heater 190 produces heat in an amount which reliably heats the cleaning fluid provided by the pump 90 to the heat exchanger 100 such that the

temperature of the cleaning fluid exiting the heat exchanger 100 as sensed by the temperature sensor 193 may be delivered at an appropriate temperature to the cleaning fluid dispenser 110. The current arrangement as seen in Fig. 3 permits the controller 200 to cause the remotely controllable fluid flow control device 112 to direct the heated cleaning fluid 73 to the cleaning fluid dispenser 110 and/or the fluid dispensing tank 72. When cleaning fluid 73 is delivered back to the fluid dispensing tank 72, the temperature of the cleaning fluid 73 correspondingly increases. As the temperature increases, the controller is operable to decrease the amount of heat energy delivered by the catalytic heater 190 to the heat exchanger 100. This facilitates the conservation of fuel ~~provide~~ provided by the fuel source 160.

OPERATION

[0030] The operation of the described embodiment of the present invention 10 is believed to be readily apparent and is briefly summarized at this point. The invention 10 is best seen in Fig. 3 and may be made integral or is incorporated within prior art devices such as shown in Figs. 1 and 2. The present invention 10 includes ~~a~~ the fluid dispensing tank 72 which is operable to dispense a cleaning fluid 73. ~~A~~ The heat exchanger 100 is coupled in downstream fluid flowing relation relative to the fluid dispensing tank 72. ~~A~~ The source of a combustible fluid fuel 160, and ~~a~~ the source of air, such as ambient air are provided. ~~A~~ The catalytic heater 190 is positioned in heat transferring relation relative to the heat exchanger 100, and which further is coupled in fluid flowing relation relative to the combustible fluid fuel 160. The catalytic heater 190 catalytically combusts a substantially nonflammable mixture of the combustible fluid fuel 160 with air (typically ambient air) to produce heat energy which heats the fluid dispensed from the fluid dispensing tank 72.

More specifically, and as earlier discussed ~~a~~ the pump 90 is coupled in fluid flowing relation relative to the fluid dispensing tank 72 and is operable to remove the cleaning fluid 73 and supply it to the heat exchanger 100. ~~A~~ The filter assembly 80 is provided and which is operable for removing particulate matter from the cleansing fluid 73. The filter assembly 80 is disposed in downstream fluid flowing relation relative to the fluid dispensing tank, and in upstream fluid flowing relation relative to the pump. As seen in Fig. 3, ~~a~~ the first remotely controllable fluid flow control device 162 is provided, and which is operable to meter the source of combustible fluid fuel 160. Still further, ~~a~~ the second remotely controllable fluid flow control device 112 is provided and which directs the heated cleaning fluid 73 to the cleaning fluid dispenser 110 and/or the fluid dispensing tank 72. ~~A~~ The controller 200 is also provided, and coupled in controlling relation relative to the first and second remotely controllable fluid flow control devices 162 and 112, respectively. The controller, by means of the fluid flow control device 162 causes the selective delivery of the combustible fluid fuel 160 to the catalytic heater 190. As earlier discussed, ~~a~~ the blower assembly 180, when energized by the controller 200, supplies ~~an~~ the air stream 181 which is mixed with ~~a~~ the stream of combustible fluid fuel 163 supplied by the source of combustible fluid fuel source 160. As earlier noted, ~~a~~ the fluid dispenser 110 is coupled in downstream fluid receiving relation relative to the heat exchanger 100 and is operable to dispense the heated cleaning fluid 73 on an object of interest such as carpeting and the like.

~~[0030]~~ [0031] Therefore the cleaning apparatus 10 of the present invention includes a wheeled chassis such as what is shown with the prior art devices at 11 and 41. ~~A~~ The fluid dispensing tank 72 is borne by ~~a~~ the chassis of this type, and dispenses ~~a~~ the cleaning fluid 73 which is to be applied to an object of interest such as ~~a~~ the supporting surface 13 which may have carpet or other flooring surfaces positioned thereon. ~~A~~ The

fluid recovery tank 140 is provided, and is borne by the chassis, and which receives cleaning fluid which is removed from the object of interest such as the supporting surface. ~~A~~ The fluid dispenser 110 is coupled in fluid flowing relation relative to the fluid dispensing tank 72 and dispenses the heated cleaning fluid 73 on the object of interest. ~~A~~ The fluid extractor 120 is coupled in fluid flowing relation relative to the fluid recovery tank 140, and removes the fluid dispensed by the fluid dispenser 110 onto the object of interest. ~~A~~ The heat exchanger 100 is disposed downstream of the fluid dispensing tank 72, and upstream of the fluid dispenser 110. The heat exchanger is operable to transmit heat energy to the cleaning fluid which travels from the fluid dispensing tank 72 to the fluid dispenser 100. ~~A~~ The source of a fuel 160 is borne by the wheeled chassis. Still further, and as seen in Fig. 3, ~~an~~ the air stream 181 is provided by means of a blower 180 or the like and is mixed with the source of fuel 160 to produce a substantially nonflammable mixture of the fuel and air. ~~A~~ The catalytic heater 190 is borne by the chassis, and disposed in fluid receiving relation relative to the substantially nonflammable mixture of the fuel and air. The catalytic heater 190, when supplied with the substantially nonflammable mixture of the fuel and air produces heat energy which is supplied to the heat exchanger for heating the cleaning fluid 73. The combustion of this substantially nonflammable mixture produces substantially no toxic emissions. As earlier discussed, ~~a~~ the temperature sensor 193 is disposed downstream of the heat exchanger 100 and is operable to detect the temperature of the cleaning fluid 73 which has been heated by the heat exchanger 100. ~~A~~ The remotely controllable fluid flow control device 162 is provided and which selectively meters the source of fuel 160 to produce ~~a~~ the fuel stream 163 which is combined with the air stream 191 to produce the substantially nonflammable mixture of the fuel and air. ~~A~~ The fuel sensor 192 is provided, and which is disposed downstream of the catalytic heater 100 and

which is operable to detect any uncombusted fuel 160 which passes through the catalytic heater 190. ~~A~~ The controller is borne by the chassis, and which is electrically coupled in sensing relation relative to the temperature sensor 193, and the fuel sensor 192, and which further is disposed in controlling relation relative to the remotely controllable fluid flow control device 162.

~~[0031]~~ [0032] Therefore it will be seen that the cleaning apparatus 10 of the present invention, is best seen in Fig. 3, provides a convenient means by which many of the perceived shortcomings of the prior art devices as earlier discussed are easily overcome and further provides a cleaning apparatus which is operable to reliably deliver heated cleaning fluid to an object to be cleaned in a manner not possible heretofore. The present cleaning apparatus 10 further provides enhanced operational capability for prior art devices such as illustrated in Figs. 1 and 2 and may be further incorporated into same.

~~[0032]~~ [0033] In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features shown and described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.